# 1—*Decapod Crustacea (Callianassidae) from the Eocene of Victoria*

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## Abstract

A description of *Callianassa bakeri*, n. sp., two other species of *Callianassa*, and *Ctenocheles victor*, n. sp., from Eocene strata recently recognised on the coast of Victoria, south-east of Princetown, followed by a discussion of fossil burrows of *Callianassa* in the Pebble Point beds.

## Introduction

In 1942 Mr. G. Baker submitted to the writer for identification some fragmentary remains of *Callianassa* which he had found in the course of his investigations of Tertiary rocks on the coast of Victoria, south-east of Princetown (Baker 1943, p. 241). Subsequently, similar fossils were found in considerable numbers in the basal beds of this sequence (Pebble Point Beds), the age of which had been recognised as Eocene, and also in a band of glauconitic gritty mudstone about 500 feet higher in the section which Mr. Baker, in a forthcoming further publication on the geology of this general area, proposes to name "Rivernook Bed." Although the Crustacean remains are fragmentary and have no immediate bearing on the stratigraphic problems which are the principal object of the current investigations, their comparative abundance, the well-defined characters of most of them, and certain other palaeontological observations connected with their occurrence justify the decision to place these discoveries on record.

Family: CALLIANASSIDAE.

Genus **Callianassa** Leach, 1814.

CALLIANASSA BAKERI, *nov. spec.*

(Plate 1, figs. 1-5)

Diagnosis—A *Callianassa* with the hand elongated, the upper and lower edges carinate, upper margin with small serrated teeth, lower margin with rows of pointed granules, both surfaces evenly convex and finely granulate, immovable finger slender.

Distribution—Eocene (Pebble Point beds): Between Point Margaret and Point Pember (north-west of Pebble Point) and between Point Bell and Devil's Kitchen (south-east of Pebble Point); about thirty specimens. All localities are on the coast south-east of Princetown, Victoria, 2 to 3 miles south-east of the mouth of the Gellibrand River.

Collection—24 specimens collected by Mr. G. Baker. Collection of the Geology Department, Melbourne University. Holotype No. 1920. Six specimens in private collection of Mr. O. P. Singleton.

Material—Sixteen specimens of the right and seven of the left manus, about seven with the immovable finger partly preserved.

Description—The hand is elongate. The following measurements were taken on six specimens: Lengths of upper margin 14, 12.5, 10.5,

10, 9 mm.; lengths of lower margin to base of immovable finger 15, 13, 11, 10.4, 9.5 mm.; maximum heights 10.5, 9.5, 9, 8.5, 6.7 mm.; minimum heights 8.5, 8.7, 7.7, 7.5, 5.7 mm. The upper edge is straight and curves gently downward near its proximal and distal ends. It forms a right angle with the straight proximal margin. The lower edge is markedly convex in side view. The distal margin slopes steeply forward. The upper and lower margins are carinate over almost their entire length. The upper carina is sharp, with a single row of small serrated sharply pointed teeth. The lower carina is slightly less sharp, with a median row of granules which is accompanied by lateral rows of somewhat irregularly spaced perforated granules (sockets), becoming more conspicuous near the base of the immovable finger. The inner and outer surfaces of the hand are regularly and almost equally convex. The outer surface is covered with widely scattered granules, mainly on the lower half. The inner surface is more evenly granulate, with the granules tending to become arranged in vertical rows near the lower margin. The granulation is not visible on internal casts which show only muscle attachment pits. The immovable finger is slender, rounded in cross section, directed downwards at a very small angle, with a finely granulated prehensile edge near its base and one or two small triangular teeth on its proximal part. There is no appreciable variation in shape or ornamentation. Two small chelae which were found in the Pebble Point beds are more elongate and their granulation and carination is weaker than in the typical *C. bakeri*. The two aberrant specimens cannot be definitely assigned to the common species here described.

Remarks—This species resembles *C. menziesi* Withers from the Middle Eocene (Scotland beds) of Barbados, and *C. panamensis* Glaessner (*C. elongata* Rathbun, *non* Fritsch) from the Culebra formation (Middle to Upper Oligocene) of Panama. It differs from *C. menziesi* in the more convex lower margin, the straight proximal margin, and the ornamentation of the surface. *C. panamensis* has a more strongly inclined distal margin and also a different ornamentation. Figures and descriptions of other elongate *Callianassa*-chelae such as *C. erecta* Böhm, *C. nuda* Beurlen, *C. songoensis* Böhm, *C. longa* Noetling, *C. delta* Rathbun and *C. brazoensis* Stenzel have also been compared but were found to differ from *C. bakeri* either in the character of the margins or in details of the ornamentation. It is remarkable that most of the chelae of this type were found in Lower Tertiary deposits.

### Callianassa *cf.* lacunosa Rathbun.

(Plate 1, fig. 6a, b)

cf. 1918 *Callianassa lacunosa* Rathbun, U.S. Nat. Mus. Bull. 103, p. 138, pl. 59, figs. 8-11 (Culebra formation. Panama, Middle to Upper Oligocene).

cf. 1926 *Callianassa lacunosa* Rathbun, Withers, Geol. Mag., vol. 63, p. 105, pl. 9, figs. 3, 4 (Scotland beds, Barbados, Middle Eocene).

cf. 1935 *Callianassa hulli* Rathbun, Geol. Soc. Amer., Spec. Papers No. 2, p. 72, pl. 15, figs. 30-35 (Midway group, Arkansas, Paleocene).

Distribution—Eocene, Rivernook Bed, south of Rivernook House, on coast about 1¼ miles south-east of the mouth of the Gellibrand River, Victoria.

Collection—Geology Department, Melbourne University, No. 1923 (coll. Mr. G. Baker).

Material—One incomplete right hand.

Description—Upper and lower margin strongly convergent, lower and proximal margin forming a right angle. Outer surface evenly convex, with a short ridge at the base of the immovable finger; inner surface almost flat but somewhat inflated above the middle. Upper edge carinate, smooth, with a row of eight small sockets below the rim on the inner surface. Lower edge not well preserved, possibly granulate. Few scattered granules on both sides of the lower part of the hand. The measurements of this specimen are as follows: Upper margin 8.5 mm., lower margin 8 mm., proximal height 8 mm., distal height 7 mm., length at the level of the interdigital sinus 8.5 mm., thickness 3.4 mm.

Remarks—This species is remarkably close to the American species *C. lacunosa*, of which *C. hulli* is probably a synonym. The ornamentation of the inner side of the propodus is a very striking feature which does not occur in other species of the genus. The present specimen differs, however, in the marked convergence of the upper and lower margins and in the shorter infradigital ridge.

### Callianassa sp.

(Plate 1, fig. 7a, b)

About eight hands and a dactylus of a *Callianassa* from the Rivernook locality represent another species which is undoubtedly distinct from *C. bakeri* and *C. lacunosa*. A small right and a left hand were found close together and belonged evidently to the same individual. These remains are unfortunately not sufficiently well preserved for a complete description of specific characters and no species name will be proposed for them.

The hand is short and high, with the upper and lower margins straight and sharply keeled and converging only slightly toward the distal margin. The proximal and distal margins converge more pronouncedly downward. The outer surface is moderately convex. The inner surface is generally flat, with a broadly rounded crest along its central part. The immovable finger, which is incompletely preserved, is compressed at its base, with its upper edge sloping rapidly downward and with a rounded ridge extending a short distance below the articulation of the dactylus. There are about 10 weak granules scattered about the outer surface of the propodus near the base of the immovable finger. The inner surface shows a row of circular pits just above the lower margin, with two parallel rows of smaller and more widely scattered pits above it. The measurements of the largest specimen which is preserved as an internal cast are as follows: Upper margin 10 mm., lower margin 9 mm., proximal margin 10 mm., distal margin 9.2 mm., greatest height 10.25 mm., thickness 3.7 mm.

A dactylus was found in a small rock specimen about one-half inch from a propodus of which only an external mould remains. It is compressed and high, with a thin upper keel and a sharp prehensile edge with a toothlike projection near its base. There are three or four large circular pits just below the upper edge.

A small chela in which the immovable finger is preserved represents a third species of *Callianassa* from the Rivernook Bed. It resembles *C. bakeri* in its elongate shape, but differs in the straight lower margin and straight finger, and does not show the characteristic ornamentation of the species from the Pebble Point beds.

### Genus **Ctenocheles** Kishinouye, 1926.

1914 ?*Pentacheles,* Balss, Abh. K. Bayer, Akad. Wiss., II. Suppl.-Bd., 10. Abh., p. 75 (Cheliped only).
1926 *Ctenocheles.* Kishinouye, Annot. Zool. Japon., vol. 11, p. 63.
1935 *Ischnodactylus,* Rathbun, Geol. Soc. Amer. Spec. Papers Nr. 2, pp. 63-65 (*non Ischnodactylus* Pelseneer).
1939 *Thaumastocheles,* Beurlen, Palaeont. Zeitschr., vol. 21, p. 137 (*non Thaumastocheles* Wood Mason).
1945 *Ctenocheles,* Melbourne Ward, Mem. Queensland Mus., vol. 12, p. 134 Genotype, *C. balssi* Kishinouye.

Four isolated, long, thin, denticulate fingers, lying on a small rock specimen from the Rivernook locality, closely associated and partly overlapping, and evidently belonging to a single individual, are assigned to *Ctenocheles.* This genus was established for a living Thalassinid corresponding in essential features with *Callianassa,* but distinguished by the excessive development of the right cheliped which resembles that of the lobster-like deep-sea Decapod *Thaumastocheles,* but differs in the external position of the dactylus, the smooth propodus and the arrangement in a single plane of the denticles on the fingers. The type species was found in deep water off Japan. Recently another species was described from Moreton Bay, Queensland. It appears now that several species of Decapod claws from the Lower Tertiary of Alabama, Mississippi and Hungary, described under different generic names, belong to this genus.

#### Ctenocheles victor nov. spec.

(Plate 1, figs. 8, 9)

Diagnosis—Fingers of the large chela very thin and long, with regularly alternating longer and shorter curved and pointed teeth, those of the small chela with a row of granules and with the distal ends curved.

Distribution—Eocene, Rivernook Bed, outcrop south of Rivernook House, on coast about 1¼ miles south-east of the mouth of the Gellibrand River, Victoria.

Collection—Geology Department, Melbourne University, Nos. 1925, 1926 (coll. Mr. W. J. Parr).

Material—Four fingers of the first pair of chelipeds belonging to one individual. As the fingers are lying in different directions and are overlapping each other, they were partly damaged and partly left concealed when the rock specimen containing them was split open.

Description—Both fingers of the larger cheliped are laterally compressed, long, thin, and straight. The base of the immovable finger is preserved, but its tip is not clearly visible. Its length is approximately 13 mm. The distal end of the dactylus is broken off and the proximal end is concealed. As preserved, its length is 14 mm. In both fingers the prehensile edge is armed with a row of pointed conical teeth. On the dactylus about 5-6 slightly curved long teeth (over 1 mm.) are visible; they are regularly spaced, with about three shorter teeth

(less than ½ mm.) in each interval. The arrangement on the immovable finger seems to have been similar. There are indications that this finger was directed slightly downward, forming an angle with the lower edge of the propodus, which however is not preserved.

The fingers of the smaller cheliped are rounded in section, with a row of granules of slightly varying size on the prehensile edges and several rows of widely spaced pores on the surface of the immovable finger. The distal ends are distinctly curved. The length of the immovable finger of the smaller cheliped is 7 mm.

Remarks—The preservation of the fingers of the first pair of chelipeds without any traces of other parts of the integument is undoubtedly due to the characteristic weak calcification of the burrowing Callianassidae. The remains of the animal must have been buried before it disintegrated and the more strongly calcified fingers were apparently shifted out of their original position as a result of some slight subsequent disturbance of the embedding sediment.

*Ctenochelcs victor* differs from the living Australian *C. collini* M. Ward in the slender shape of its fingers. It resembles very closely *C. balssi* (fig. 1), but the teeth on the larger fingers are

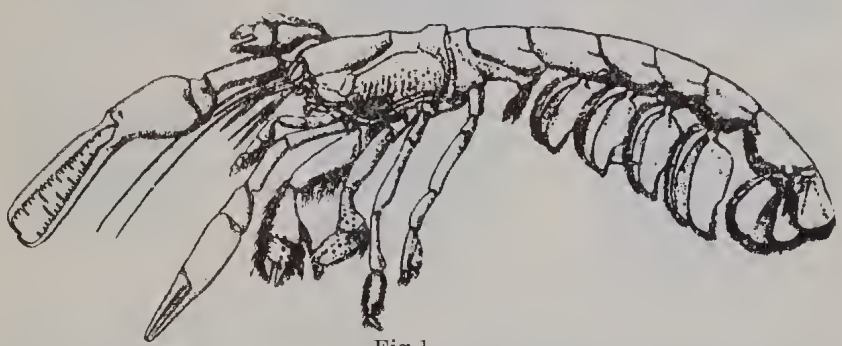

Fig 1.

more regularly arranged, and the ends of the smaller fingers are more distinctly curved. The incomplete chelae from the Middle Oligocene of Hungary which Beurlen (1939) described as *Thaumastocheles rupeliensis* possess the distinctive features of *Ctenocheles.* Beurlen drew attention to their striking resemblance with the cheliped described by Balss as *Pentacheles* sp.?, but overlooked the fact that Kishinouye had proved that this fragment belonged to the type species of his new genus. The fragmentary hands and fingers described by Rathbun (1936) from the Paleocene and Eocene of Alabama and Mississippi as *Ischnodactylus* (*I. cookei, I. cultellus, I.? dentatus*) also agree with *Ctenocheles* in their shape and weak ornamentation and calcification; the denticulation of most of these fingers is incompletely preserved. It should be noted that their identification with *Ctenochcles* does not affect other species of *Ischnodactylus* such as the Cretaceous *I. macrodactylus* (Schlüter) and *I. esocinus* (Fritsch), in which long spiny claws are associated with lobster-like remains of the carapace or abdomen. Long fingers with long pointed teeth occur in more than one family of Decapod Crustacea, but the shape, calcification and ornamentation of the hand and fingers make it possible to distinguish them.

### Burrows of *Callianassa* in the Pebble Point Beds

A peculiar type of cylindrical structures, obviously of organic origin, occurs in great abundance in the Pebble Point Beds at Buckley's Point and attracts attention, particularly on weathered surfaces (Plate 1, fig. 10; Plate 2, figs. 1-5). The friability of the rock makes it difficult to collect satisfactory specimens or to take reliable measurements. The following observations on these structures were made in the lowest beds resting on the eroded surface of the Jurassic at Buckley's Point, one half-mile north-west of Pebble Point, and along the coastal outcrop of the gritty beds north-westward towards Point Margaret. The tubes vary in size, but most of them are between ½ inch and one inch thick. They are mostly fairly straight, occasionally bifurcating, and lying either parallel to the bedding planes or at right angles to them or in various other directions. Their length could not be measured as they become clearly visible only as portions of them weather out of the rock. They are eroded away soon after their emergence from the matrix. Blind ends of the tubes are seen occasionally. Most of the specimens collected are formed from more fine-grained material than the immediatcly surrounding matrix, but sand grains occur in the filling of the tubes. Significant characters of these structures which distinguish them from the mud-filled worm burrows commonly occurring in marine sediments can be summarised as follows:—(1) Generally straight course, with more or less angular changes in direction; (2) bifurcating but not arborescent branching; (3) limited size-range; (4) smooth surfaces, without agglutination of pellets or foreign bodies to form walls; (5) occurrence of blind ends.

These features, taken in conjunction with the common occurrence of *Callianassa bakeri* in the same beds, suggest a burrowing Crustacean, and in all probability this species of *Callianassa*, as the originator of the burrows. The size of the *Callianassa*-claws is in reasonable agreement with the average size of the tubes. Taking the Recent *C. aequimana* W. H. Baker from the coast of South Australia as a standard, an arbitrary procedure which seems justified in view of the resemblance in the proportions of the claws with those of *C. bakeri*, it is found that in this Recent species a propodus 7 mm. long on its upper edge (equal to the smaller specimens of *C. bakeri*) corresponds to a carapace and abdomen about 12 mm. wide. This is in good agreement with the size of the four specimens of tubes collected in situ. Claws as well as tubes seem to range to about twice this size.

Fossil burrows of *Callianassa* were described in detail by K. Ehrenberg (1938) from the Lower Miocene of the Vienna Basin. Their essential characters agree well with those of the structures here discussed. A claw of *Callianassa* was discovered in the blind end of one of the tubes from the Vienna Basin locality. In his publication, Ehrenberg discussed the available information on the habits and habitat of *Callianassa* and allied forms. It is well known that the Callianassidae live in deep burrows in muddy or sandy sediments. According to Stevens (1929), *Callianassa*-burrows are very similar to those of *Upogebia*, which are described as 20-40 mm. in diameter, nearly vertical, and Y-shaped or U-shaped with two or more branches opening at the surface and with one or more short blind passages

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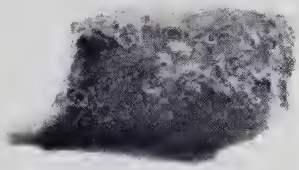

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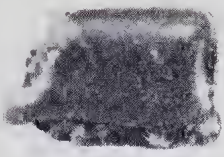

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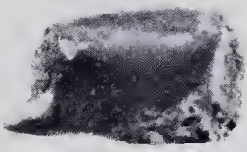

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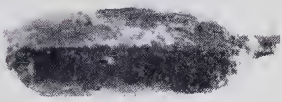

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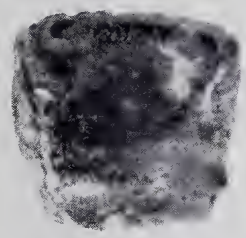

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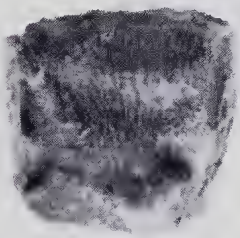

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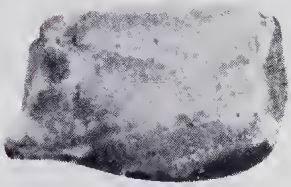

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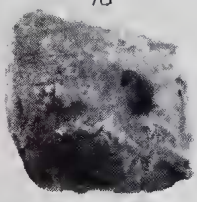

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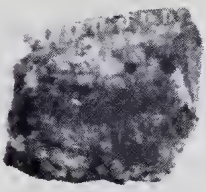

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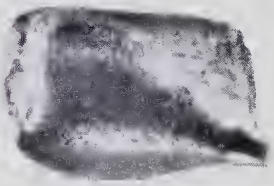

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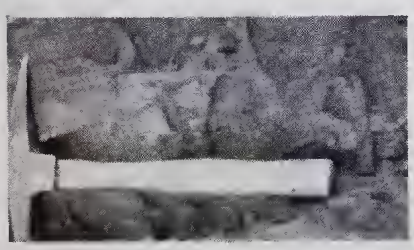

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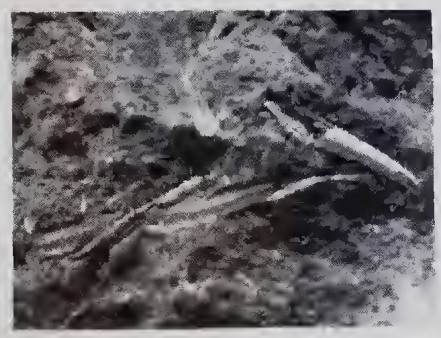

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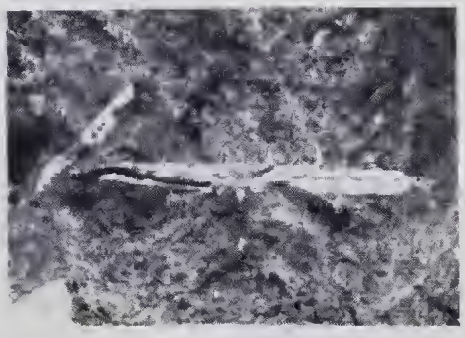

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